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# (54) Distance measuring devce and laser beam projector therefor

(57) A laser beam projector has a laser light source that outputs a laser beam, a light projecting mirror for reflecting the laser beam outputted from the laser light source, a mirror driving device for oscillating the light projecting mirror so as to scan a specified area with the laser beam and piezoelectric elements attached to a back surface of the light projecting mirror. As a voltage is applied to the piezoelectric elements, the curvature of the reflecting surface of the light projecting mirror can be changed and the visibility angle of the light beam projector can be varied. A distance measuring device is formed with such a laser beam projector together with a laser beam receiver for receiving reflected waves of the laser beam from an object and a control unit for measuring the distance to the object based on the difference between the time of projecting the laser beam and the time of receiving the reflected waves by the laser beam receiver as well as the direction of the object from the direction of the projected laser beam.

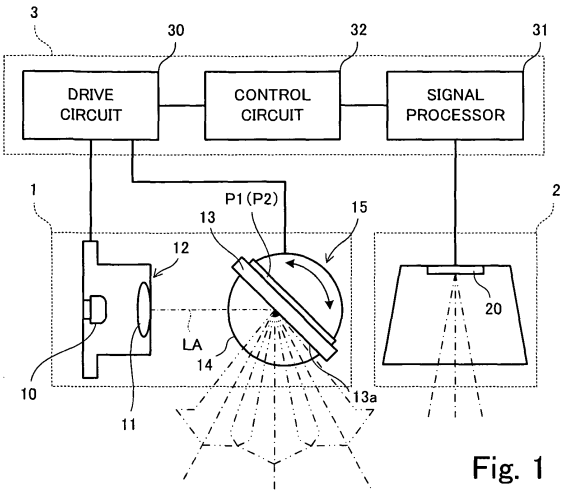


Fig. 1

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# EUROPEAN SEARCH REPORT

Application Number
EP 07 00 1179

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X | GB 2 252 398 A (COMP GENERALE ELECTRICITE [FR]) 5 August 1992 (1992-08-05)<br>* page 4, lines 20-28; figure 1 *<br>* page 5, lines 19-33 *<br>----- | 1-12 | INV.<br>G01S7/481<br>G02B26/12<br>G01S17/93 |
| A | DE 34 22 232 A1 (DIEHL GMBH & CO [DE])<br>19 December 1985 (1985-12-19)<br>* abstract *<br>----- | 1-12 | |

TECHNICAL FIELDS SEARCHED (IPC)

G01S
G11B
G02B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 7 July 2009 | Shaalan, Mohamed |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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07-07-2009

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| GB 2252398 A | 05-08-1992 | DE 2929125 C1 | 19-11-1992 |
| | | FR 2696838 A1 | 15-04-1994 |
| | | IT 1235674 B | 21-09-1992 |
| | | NO 113600 C | 16-12-1987 |
| DE 3422232 A1 | 19-12-1985 | FR 2566134 A1 | 20-12-1985 |

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